

Appl. No. 10/637,221
Reply to Office Action of January 5, 2010
Amendment Dated May 5, 2010

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AMENDMENTS TO THE CLAIMS

1. (Currently amended) An apparatus for screening or diagnosing cancer or other pathological disorder in a breast of a patient comprising:

a table having a horizontal upper surface upon which the patient may lie;

a support system adapted to support the patient comfortably and to directly contact and support the patient's breast in a fixed position while the patient lies in a prone position on the table;

a microwave assembly including a microwave source, a microwave antenna and a receiver, the microwave source coupled to the microwave antenna for directing a predefined microwave waveform energy to the breast, the receiver coupled to the antenna for and receiving reflected microwave energy from the breast under examination resulting from the predefined microwave waveform and a microwave source and a receiver coupled to the antenna; and

an orientation system for orienting a surface of the breast in known positions with respect to the anatomy of the patient and locations of the antenna; and

a processor connected to said receiver for processing the reflected microwave energy.

2. (Original) The apparatus of claim 1 wherein the support system includes a microwave-transparent scan plate carried by the table located at the upper surface so that a portion of the breast may be pressed against the scan plate.

3. (Original) The apparatus of claim 2 wherein the scan plate is optically transparent and the orientation system further comprising:

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a light source oriented to transmit light through the scan plate in order to optically illuminate the breast;

a camera for capturing a visual image of the breast and transmitting said image to the processor; and

means coupled to the processor for displaying an image including the visual image.

4. (Original) The apparatus of claim 3 wherein the orientation system further includes a scan data system for providing a scan image from the reflected microwave energy, the scan data system connected to the processor and a display for displaying the scan image of the reflected microwave energy.

5. (Original) The apparatus of claim 4 wherein the orientation system further includes means for displaying an overlay of the visual image and the scan image of the reflected microwave signal.

6. (Original) The apparatus of claim 1 wherein the orientation system further includes a scan data system for providing a scan image of the reflected microwave energy, the scan data system connected to the processor and a display for displaying the scan image of the reflected microwave energy.

7. (Original) The apparatus of claim 2 wherein the scan plate has a dielectric constant in the range of from about 1.7 to about 9.

8. (Original) The apparatus of claim 5 wherein the overlay image is a composite 3-D image.

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9. (Original) The apparatus of claim 2 wherein the position of the breast with respect to known antenna position on the scan plate that is stable within approximately 1/4th of a wavelength of the highest frequency.

10. (Original) The apparatus of claim 2 wherein an air gap of approximately 1 mm is provided between the microwave antenna and the scan plate.

11. (Original) The apparatus of claim 1 further comprising:
an enclosure that is formed as part of the table and that encompasses the microwave assembly.

12. (Original) The apparatus of claim 7 including means for suppressing microwave resonance within the enclosure.

13. (Original) The apparatus of claim 1 further comprising a microwave-absorbent resilient member located adjacent the scan plate and interposed between the scan plate and the surface of the table.

14. (Original) The apparatus of claim 7 wherein the microwave-absorbent resilient member is a bag-like pillow.

15. (Original) The apparatus of claim 7 wherein the microwave-absorbent resilient member is a collar.

16. (Original) The apparatus of claim 7 wherein the microwave-absorbent resilient member forms a padding layer on the upper surface of the table.

17. (Original) The apparatus of claim 1 wherein the processor is provided by a personal computer connected to the table.

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18. (Original) The apparatus of claim 17 wherein the personal computer provides a display.
19. (Original) The apparatus of claim 17 wherein the processor is incorporated with the table.
20. (Original) The apparatus of claim 1 wherein the orientation system includes a means for viewing the breast when in the fixed position.
21. (Original) The apparatus of claim 20 wherein the viewing means is a digital camera.
22. (Original) The apparatus of claim 1 further comprising a motorized system for moving the antenna along coordinates.
23. (Original) The apparatus of claim 1 wherein the table includes an adjustable upper surface section to aid the patient to sit upright.
24. (Original) The apparatus of claim 1 wherein the table includes a removable pad.
25. (Previously presented) The apparatus of claim 24 wherein the removable pad covers the support system.
26. (Original) The apparatus of claim 24 wherein the removable pad includes a taper in order to appropriately elevate the patient's torso in order to comfortably locate the breasts on the support member.
27. (Original) The apparatus of claim 24 wherein the removable pad is provided in an adjustable upper surface section of the table.

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28. (Currently amended) A method for imaging or detecting breast lesions comprising the steps of:
- having a patient lie prone on a table having a microwave and optically transparent scan plate;
 - pressing a patient's breast against the scan plate to support the patient's breast in a fixed position;
 - illuminating the patient's breast through the scan plate;
 - receiving a visual image of the breast by a digital camera;
 - scanning the breast with directing a predefined microwave energy waveform to the breast;
 - receiving reflected microwave energy resulting from the predefined microwave waveform to produce scanning data;
 - processing the scanning data based on reflected microwave energy; and
 - forming a displayed image including the visual image and the scanning data.
29. (Original) The method of claim 28 wherein a pair of breasts are imaged.
30. (Original) The method of claim 28 wherein the patient is oriented in order to provide a frontal imprint of the breast.
31. (Original) The method of claim 28 wherein the patient is oriented in order to provide a side imprint of the breast near the patient's armpit.
32. (Original) The method of claim 28 further comprising the step of archiving the displayed image.

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33. (Original) The method of claim 32 wherein the archiving includes a patient record, scan study data and scan series data.

34. (Original) The method of claim 33 wherein the scan series data includes a digital breast contact image, antenna scan data, region of interest data, 3D processed volumetric data, and scan parameters or image display parameters.

35. (Original) The method of claim 28 further comprising the step of analyzing the displayed image and reorienting the patient in order to provide the breasts in appropriate orientation.

36. (Original) The method of claim 35 wherein the analyzing is performed by a human viewing the displayed image.

37. (Original) The method of claim 28 further comprising the step of identifying areas of the breast to be scanned by the antenna.

38. (Original) The method of claim 37 wherein the identifying step is performed by a human using a computer mouse of a computer having the displayed image.

39. (Original) The method of claim 28 further comprising the step of orienting a microwave-absorbent resilient member adjacent the patient in order to cover a gap formed on the scan plate that are adjacent the breast.

40. (Original) The method of claim 39 wherein the microwave absorbent resilient member is a bag-like pillow.

41. (Currently amended) A method for imaging a lesion comprising the steps of:

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orienting a patient's ~~organ~~ breasts on an optically transparent scan plate to provide an imprint;

focusing a digital camera on the imprint, the digital camera having a field of view;

directing predefined a microwave waveform to the breasts;

generating a 3D generated scan image of the ~~organ~~ breasts using reflected microwave energy from each breast independently resulting from the predefined microwave waveform, the scan image having a top planar envelope;

sizing the field of view to match the size of the top planar envelope;

generating a photo image of the imprint having the sized field of view;

aligning the sized field of view with the top planar envelope; and

overlaying the photo image on the top planar envelope.

42. (Original) The method of claim 41 wherein the 3D generated scan image includes a graphical image of a lesion that is visually oriented to the imprint envelope of the patient's organ.

43. (Original) The method of claim 41 wherein the overlay is aligned to an origin point (0,0,0) on the top planar envelope.

44. (Original) The method of claim 41 wherein the 3D generated scan image includes Cartesian coordinates in the X, Y and Z planes.

45. (Original) The method of claim 41 wherein the organ is a breast and the imprint is provided on the scan plate mounted in an upper surface of an examination table.

46. (Currently amended) An examination table comprising:

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a table having a horizontal upper surface upon which the patient may lie;
a support system adapted to support the patient comfortably in a fixed position;
an orientation system for orienting a patient's torso in known positions with respect to the anatomy of the patient;
an optically transparent scan plate affixed to the table and located at the horizontal upper surface;
a light source oriented to transmit light through the scan plate in order to optically illuminate the torso;
a camera for capturing a visual image of the torso and transmitting said image to a processor;
a scan system for directing a predefined microwave waveform to a portion of the patient and for receiving reflected microwave energy resulting from the predefined microwave waveform; and
means coupled to the processor for displaying an image including the visual image of the torso's imprint.

47. (Cancelled).

48. (Original) The apparatus of claim 46 wherein the support system includes an adjustable upper surface section to aid the patient to sit upright.

49. (Original) The apparatus of claim 46 wherein the support system includes a removable pad.

50. (Original) The apparatus of claim 49 wherein the removable pad covers a scan plate carried by the table.

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51. (Original) The apparatus of claim 49 wherein the removable pad includes a taper in order to appropriately elevate the patient's torso in order to comfortably locate the torso on the scan plate.

52. (Original) The apparatus of claim 49 wherein the removable pad is provided in an adjustable upper surface section of the table.

53. (Previously Presented) The apparatus of claim 46 wherein the orientation system provides scan data regarding the patient's breast with respect to at least breast tissue, a nipple, a sternum, an armpit or a lesion.